AMRAD NEWSLETTER

Amateur Radio Research and Development Corporation September 1981

DON'T COME TO THE AMRAD MEETING ON LABOR DAY, September 7th, because the library will be closed. Instead...

A SPECIAL MEETING ON THE 21st will be held in order to coordinate arrangements for the October 16 ARRL Conference on Amateur Radio Computer Networking (Packet Radio). All AMRAD members planning to attend the October 16 conference should come to this special meeting if possible. We will discuss the agenda and make adjustments as necessary to fit everything in. Accommodations and local transportation for out-of-town guests need to be sorted out. So, please come to the September 21 meeting if you feel that you can help with the program or logistical arrangements.

OCTOBER 16 ARRL CONFERENCE letters of intent to present papers were due on August 15. And, wow, did we get a response! At the moment, we have thirteen papers promised. Two of them are absentee papers, meaning that the authors will not be there to make oral presentations. The general plan is to have the papers given starting in the morning around 9 A.M. The afternoon session will feature panel discussions on various topics such as overall structure, the inter-city network, local area networks, message handling protocols, etc, although the exact breakdown will be announced later. Papers are now expected from:

David W. Borden, K8MMO	Sterling, VA
Dennis T Connors, KD2S	Tucson, AZ
Rich Doering, WA6CFM	Argonne, IL
Dave Ingram, K4TWJ	Birmingham, AL
Joe Kasser, G3ZCZ	Tel Aviv, Israel
Douglas Lockhart, VE7APU	Vancouver, BC
Hank Magnuski, KA6M	Menlo Park, CA
Paul L. Rinaldo, W4RI	McLean, VA
Steven Robinson, W2FPY	Moorestown, NJ
Barry Strassler	Silver Spring, MD
Jim Tiefenthal, W2IS/DJØCQ	Muenchen, W Ger
Russell Ward Jr, WA4ZZU	Nashville, TN
Robert E. Watson	Gaithersburg, MD
Jens Zander, SM5HEV	Linkoping, Sweden

OUR PROTOCOL AND SPREAD SPECTRUM COLUMNS are missing from this issue of the AMRAD Newsletter in order to make space for a long article on real-time computer analysis of electrical activity from storm fronts. The author, Dick Fergus, W9DTW, has written us to ask whether AMRAD can stir up some interest in use of amateur electronics methods of providing warning of various types of severe weather. If interested, please contact Dick directly.

PROTOCOL COLUMNIST Dave Borden, K8MMO is collecting data for a larger than usual column in the October issue, as a backdrop to the October 16 conference. In this issue you will find a breakdown of HDLC protocol supplied by Hank Magnuski. Hank also reports that the San Francisco Bay Area packet network is approaching 30 stations. We also just received more info from Hank which will be cranked into the Protocol column. Our neighbors to the North have been very quiet during the Canadian postal strike, which we understand is now over. Nevertheless, Doug Lockhart slipped down to Oregon for a DX meeting and packet demo. He made final arrangements for production of 100 Terminal Node Controller boards at a Washington state printed-circuit factory. Backorders should all be shipped by September 11. It looks like everything else can keep 'til next month, except possibly to note that Sandy, WB5MMB is spearheading the effort to set up a two-meter packet repeater. An *ad hoc* group is meeting on August 19 to discuss parameters of the new repeater.

SPREAD SPECTRUM SIG SECRETARY, Hal Feinstein, WB3KDU, said that he has been in touch by telephone with a number of people included in the STA. From this incomplete poll, it looks like the only active experimenting during these summer months is by a few in the Washington, DC area. For those having STAs for spread spectrum experiments, be aware that time's not standing still. We'd like to include the results of your work in the year-end STA report due to the FCC around next March.

++++++++++ PACKET RADIO HDLC PROTOCOL NOTES ++++++++++

The protocol used by the Vancouver Digital Communications Group controller board, and also used by the packet radio repeater is based on a subset of HDLC standard protocol. In this protocol the standard unit of information is the frame:

```
-------------------------------------------------------------------------
| SYNC | SYNC | FLAG | ADDR | CNTL | TEXT | ... | TEXT | FCS1 | FCS2 | FLAG |
-------------------------------------------------------------------------
```

where

SYNC	-	preframe synchronization, idle flags or zeroes
FLAG	-	start of frame, bit pattern 01111110
ADDR	-	address byte, hex 00 to FF
CNTL	-	control byte, indicates type of frame, other info
TEXT	-	optional information field
FCS1	-	first byte of frame check sequence (CRC)
FCS2	-	second byte of frame check sequence
FLAG	-	closing flag

other features used

bit stuffing	-	provides fully transparent transmission of data
NRZI encode	-	Zeroes cause transition which allows clock recovery
multiframe	-	Up to seven frames permitted in a single transmission

types of frames

Non-sequenced-information	-	Used for Connect/Disconnect
Supervisory	-	Used for window & flow control
Information	-	Used for transmission of text

NSI Frames:

FLAG ADDR CNTL FMCALL TOCALL FCS1 FCS2 FLAG

ADDR - Address of calling station (assigned to each station)

CNTL - 17H = Connect request
07H = Connect acknowledge
53H = Disconnect request
43H = Disconnect acknowledge

The Poll/Final (P/F) bit, 10H, is used to force a response from the receiving station. Used here and in other frame types for this function.

FMCALL - Call of station originating the frame (6 characters)
TOCALL - Call of station receiving the frame (6 characters)

The callsign is left-justified in the field and padded with trailing blanks if the call is shorter than 6 characters.

Supervisory Frames:

FLAG ADDR CNTL FCS1 FCS2 FLAG

ADDR - Address of sender

CNTL -

```
  7   6   5   4   3   2   1   0
-----------------------------------
|     Nr      |P/F| 0   0   0   1 |  Receive Ready
-----------------------------------

-----------------------------------
|     Nr      |P/F| 0   1   0   1 |  Rcv Not Ready
-----------------------------------
```

Nr = Sequence count of next expected I-frame
P/F = Poll/Final bit

Information Frames:

FLAG ADDR CNTL TEXT ... TEXT FCS1 FCS2 FLAG

ADDR - Address of sender

CNTL -

```
  7   6   5   4   3   2   1   0
-----------------------------------
|     Nr      |P/F|     Ns    | 0 |  I-frame
-----------------------------------
```

Nr = Sequence count of next expected I-frame
P/F = Poll/Final bit
Ns = Sequence count of this I-frame

TEXT - Text field, 128 bytes maximum, ASCII code

Timeouts:

T1	-	Receive timeout, 2-3 seconds
T1S	-	Frame timeout, time for frame of maximum length
Tr	-	Delay time (random) prior to transmission of first frame of a sequence, 150 milliseconds to 1.25 seconds

Addresses: (as used in SF Bay area, subject to change)

00	-	No operation
01-7F	-	Station direct connect addresses
80	-	Reserved
81-9F	-	Repeater input channel addresses
A0	-	Reserved
A1-BF	-	Repeater output channel addresses
C0-FE	-	Reserved
FF	-	All parties addressed

Hank Magnuski, KA6M
August 5th, 1981

REAL TIME ANALYSIS OF ATMOSPHERIC RADIATION FROM WEATHER FRONTS

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Serendipity Repeater Corp.
Lombard, Illinois
(312) 629-5745

INTRODUCTION

For many years meteorologists have suspected that the electrical activity from storm fronts relates to the severity of the front. Many investigators have attempted to predict severe weather, especially tornadoes, by monitoring this activity. These efforts have not produced a reliable warning system although some of the results lead one to believe additional effort might be fruitful. Most of these investigators were handicapped by available instrumentation of the day. Modern technology with the microprocessor offer considerably more sophistication for detailed analysis of this activity.

The electromagnetic radiation produced by the storm front, which is often called "sferics", offers a range of monitoring parameters. The radiation occurs as pulses with frequency components from the very low to the ultra high range. The average pulse rate tends to follow the severity of the front. These pulses often occur in bursts. The timing factors vary from milliseconds between pulses in a burst to fractions of a minute between pulses when the front is in an early stage. The low frequency pulse components can be detected from over 1000 miles providing a large monitoring area.

The system that will be described monitors the 10 kHz. component of the frequency spectrum and concentrates on the timing relationships of the pulses with emphasis on the timing within the bursts.

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SYSTEM DESCRIPTION

Data collection requirements were determined from visual observations on equipment which displayed relative timing and the direction of arrival of the event. These observations, which were difficult to analyze and record, indicated timing patterns that appeared to correlate with the severe weather. It was also noted that average characteristics of a group of events appeared more meaningful than individual events. The appearance of event bursts suggested some measurement of relative time between events. Since the purpose of this analysis would be to detect the patterns noticed on the visual monitor, a real time data reduction was selected. An alternate selection would be to store the data in real time and perform the analysis at a later time. This has an advantage which allows reanalysis of the data but would require considerable mass storage equipment and delay the analysis results.

Since the purpose of the project is to develop a warning system, the analysis time is critical. The mass storage equipment was also beyond the resources available.

RECEIVING EQUIPMENT The radiation is detected with a crossed loop antenna system and converted to a direction signal with analog circuity. Each event is presented to the processor as a single data byte.

PROCESSOR EQUIPMENT An 8 bit microprocessor and associated components perform the analysis and recording function. About 4K of

memory is used for the program an additional 12K is used for data storage. A more detailed description of the equipment will be presented later in the paper.

PROGRAM DESCRIPTION

DATA FORMAT The data byte from the receiver represents the event direction of arrival with three degree resolution or 120 segments (00-77 hex). The results of data analysis are labeled with the direction of arrival throughout the program. The time of arrival is determined with a resolution of 4.5 milliseconds.

DATA TIMING These events arrive at random times. Events of one burst may be intermixed with events from another front in a different direction. In addition, when an event arrives, there is no evidence if the event is part of a burst. A "delay line" has been simulated with a memory block and a circulating pointer. The pointer wraps around from end to beginning of the block. The new events are essentially pushed into the delay line. When data appears at the end of the line, it will either be a lone event or the first event of a burst with the remaining events somewhere in the line. Although the data does not move in the memory block, the circulating pointer makes the data appear to move if the data position is considered relative to the pointer position. Therefore, the memory block contains the direction data of the most recent events with the relative time of arrival indicated by the position in the block.

ANALYSIS ROUTINE The raw data is maintained in a record table for the last 128 time increments or about 0.6 seconds. This record is searched during each time increment for matching data or events from the same direction. Another record is built with the data found in the search. This record describes the burst of events. Several analysis of the burst are noted in appropriate categories as accumulations of the number of times that analysis has occured. Periodically, the accumulation record is searched to develop a file of peak activity or direction of activity. Several characteristics of the activity peaks are noted and recorded on the printer. This recording is in both numerical and graphic form.

RAW DATA TABLE A memory block of 128 words (delay line) is reserved for storage of the data as received from the receiver. A periodic interrupt initiates a routine which stores input data if an event has occured since the last interrupt, then advances the block pointer. If the pointer passes the end of the block, it is reset to the beginning and the new pointer address is saved for the next interrupt. The data, if any, in the new location is the oldest in the block and may be the first event of a burst. A representative listing is shown below:

```
33C0 00  Table beginning
..
..
340F 5A
3410 00
3411 4C  Current data
3412 27  First event-current time
3413 3F
3414 00
3415 27  Second event
3416 00
3417 28  Third event
3418 00
..
..
343F 00
Wrap around to the beginning
```

If the new location is clear (no data), the routine is terminated.

BURST TABLE When data is found in the raw data, it may be the first event of a burst. The data (direction) is saved in the first location of the burst table and the raw data location is cleared. The remaining raw data table is searched for matching (within plus or minus one) data. When data is found, the location is cleared and the number of locations from the prior data (time-between-events or TBE) is saved in the next location of the burst table. The following illustration describes the burst table with data found from the raw data table illustration:

```
345A 00  Burst end marker
..
..
345D 02  TBE second to third event
345E 03  TBE first to second event
345F 27  Event direction
```

When the search is completed, the table contains a description of the burst by direction and the relative time increments between the events. All events from the burst are also removed from the raw data

table.

DATA ACCUMULATION The burst table data is sorted into several categories and labeled by direction segment. At this time, there are five categories for each direction segment. The memory assigned to each of these elements functions as an accumulator. Some elements use two memory bytes for extended counting range. Data from each burst table is analyzed and counted in the appropriate accumulator element.

One element sums the total activity. Each event is counted once either as part of a burst or individually if a burst has not occured.

The TBE's (time-between-events) of two selected ranges are summed in two elements. These two elements will be used later to develop a ratio between the different TBE time factors.

Another element counts bursts which contain more than a set number of events.

The variation between the TBE's is determined and, if the variation is less than a set value, the burst is considered to have a periodic factor which is accumulated in the last element.

BURST SPECTRUM For a selected band of direction segments, the bursts are analyzed by event position and relative timing. This data is accumulated with elements similiar to the previous description. In this case, a matrix is formed by event position on one axis and relative timing on the other. At present only one band or region of interest can be studied at one time. This band is generally at a peak of activity relating to a storm front. Provisions have been made to follow the front, e.g., update the direction band as the activity changes direction.

PROGRAM TIMING LIMITATIONS The routines described to this point must function with each event as the event arrives. This requires the routines to take less than one timing increment or 4.5 milliseconds. Most of the time is used to search the raw data table. Essentially, this timing limitation determines the maximum size of the raw data block and the time span of the data available for analysis.

PEAK RECORDS The data for each five minute interval is reduced to a record based on the direction of peak activity. These direction peaks are determined from the activity accumulations. The peak is labeled with the direction of maximum activity. In addition, the peak width is determined by the direction where the activity is less than 50 percent of the maximum activity. The record also contains the maximum TBE ratio, burst count, and periodic event count.

The TBE ratio is the shorter TBE (time-between-events) accumulation divided by the longer TBE accumulation. Ratios are computed for all direction segments between the peak width. The maximum ratio computed is included in the peak record.

Both the burst and periodic accumulations are summed for all direction segments within the peak and made part of the peak record.

Peak records for peaks above a set minimum are built for each five minute period. Up to 12 different peaks may be on file at one time. The last 16 files are maintained for construction of graphic trend readouts.

In addition, the five minute accumulation data is summed for a long term (one hour) readout. The peak activity, ratios, bursts, and periodic data are found with the same routines as previously described and recorded as a printer readout.

READOUT FORMAT Three formats are used to make permanent records of the collected data. An hourly printout records the average or slow changes of a front. This provides some record of a front in the early stages before it becomes violent. A graphic plot provides a more current trend when the activity builds to a higher level. The third format is for special observation of the bursts from a selected peak. The first two readouts are generated routinely as the activity dictates while the third format is setup based on an observation of the other two records.

The print style has been selected to minimize print time. In this case, it generally means that the print characters will either be figures or letters since intermixing these characters requires additional shift operations of the old teletype machine.

HOURLY READOUT Each activity peak is recorded in numerical form. Current time and date are printed on the first line with

each peak occupying a following line. A representative readout is reproduced below:

```
1347.39-06/07/80
283/280/289/00350/00316/045/002
247/226/259/01432/00594/255/055
103/103/106/01571/09294/255/007
097/094/097/03169/00309/255/017
070/067/079/02150/00238/255/023
```

The first three numbers describe the direction of the activity followed by the maximum activity, TBE ratio, burst and periodic counts.

GRAPHIC PLOT When an activity peak exceeds a set level, a graphic plot is constructed from the 5 minute activity records previously described. The oldest data is represented by the first line with each following line used for later data. A total of 16 lines represents the last 80 minutes of data. If more than one peak is on file, a new plot is generated each 5 minutes. A typical plot follows:

```
P          O     IV    I      X
P          O     I V   I      X
 P         O     I VI         X
P           O   I   IV       X
P          O    I  IV        X
P           OI    VI         X
 P         O I    I V        X
P          OI     I  V       X
  P        O     I   V       X
 P         IO    I    V      X
 P        IO    I     V      X
P         IO    I    V       X
P         IO    I   V        X
   P     I O    I    V       X
  P     I  O   I     V       X
   P   I   O   I     V       X
                154
1657.09-06/07/80
```

The characters represent data as follows: activity peak width (I), activity (V), TBE ratio (O), burst count (X), and periodic count (P). The direction reference for the (I) is shown on the next to last line with each line space to the left or right equal to three degrees. Both ratio and activity are plotted on a psuedo logarithmic scale or two line spaces either right or left means a factor of two change in the value. This example show a front which was southeast of the monitor and moved rapidly to the north or northeast. It apparently was fairly active since the burst count was full scale for the duration presented.

PROFILE The third format presents burst profile data as previously described. This matrix of TBE versus event position in the burst is printed in two scales. One scale presents a contour form by dividing the accumulated counts into three groups. The second scale reduces the counts to a letter which preserves some of the detail with a minimum of print time. A typical profile follows:

```
136/028/1902.19-06/07/80
I          ECBAABAD
II         EECCCCBA
OI  II     HFCCDFBD
OI II      MFCBEABD
IOOII      GIJGFCCH
XOOII      OMLGEBDL
OOII       MJFFCFCH
IIII       FDEDBABC
```

The activity direction is shown on the first line followed by the maximum count of any matrix element. The line is completed with the time-date.

Event position in the burst (second to ninth) is shown on the horizontal scale. The TBE is represented by the vertical scale with increasing TBE toward the top of the profile. The (X) locates the maximum count. Counts from maximum to 50 percent and 50 to 25 percent of maximum are represented by (0) and (I) respectively. This profile indicates a possible relationship between TBE and event position.

PROGRAM DISCUSSION

This program represents over four years of continuous monitoring and program modifications. The unknown nature of the input data presents some unusual problems for the programmer. First, it was difficult to develop the program requirements until some idea of input data characteristics were available. Therefore, the program development was a step by step process. Each step would present some direction for the next step.

Probably the most difficult problem was to determine if the program was working. With the random data input, there was no measure available for comparison. Also, the weather was not always cooperative, especially after a major change. Sometimes, several weeks or months would pass before the program

operation was assured.

HARDWARE DESCRIPTION

BASIC MACHINE A SWTP 6800 has been equipped with 16K RAM and 3.5K EPROM. The weather program resides in RAM while the EPROM is used for an operating system and general purpose programs.

CLOCK A clock IC with alarm and timer functions is used for time-date readout. The alarm function is used for a daily update of some data.

NUMBER CRUNCHER A number cruncher IC has been interfaced for more involved computations. Programs are available for triangulation and other geographical calculations.

PROM BURNER A memory mapped PROM burner is resident in the machine. RAM is available to emmulate the PROM which allows the PROM to be burnt directly from the RAM data.

DUAL D/A A/D An analog to digital interface converts data from several local weather instruments for display with the sferics data.

GRAPHIC DISPLAY Current accumulated data can be displayed with a SWTP graphic board. Several animated data programs were written but memory limitation restricted the number of frames that could be shown which reduced the visual effectiveness.

TAPE I/O Two cassette formats are available for storage. The 300 baud KC standard is used for backup storage and transfer of data to other machines. A 1200 baud digital system is the primary storage device.

PRINTER Hard copy is produced by an old Model 15 Teletype. This machine may be noisy and slow but it is very reliable.

BATTERY BACKUP All processor and monitoring equipment automatically switches to battery power without program interruption if primary power fails. This is absolutely necessary for this project since the most likely time of power failure is during the bad weather which this system is monitoring. The battery capacity is sufficient to run the system for at least five hours.

SUMMARY

A real time microprocessor system has been developed which analyzes the electromagnetic radiation from weather systems. Real time data reduction has been applied in an attempt to detect timing patterns which relate to the severity of the weather front. The programs to accomplish these tasks have involved maintaining relative timing tables, building other tables from reduced data, accumulating data in a number of categories, and building a readout format from the accumulated data.

The unpredictable nature of severe weather requires around-the-clock operations to assure collection of all pertinent data. Without the microprocessor or other computer equipment, this would be very difficult. It would be impossible for the amateur. One incident, which would probably have been missed without continuous data collection, was a tornado in Houston, Texas in December, 1977. A rapid activity increase from the southwest in the early morning hours indicated possible severe weather. At 8:30 AM, a tornado swept thru Houston. Even the weather bureau was surprised.

There have been many other incidents, although not as dramatic as the Houston event, where the system records produced predictive results. It has not, as yet, proven to be a reliable predictor of tornadoes although it is capable of supplementing other severe weather monitoring systems.

FUTURE PROSPECTS

There are several areas that remain to be investigated. The most promising at this time seems to be the burst timing profiles. There also seems to be some long time (10 to 20 minute) oscillatory effects. It is likely that these studies will uncover more effects leading to additional investigations.

The software has been modified many times during this project but the hardware has remained unchanged. Several hardware modifications have been considered but postponed to keep the system operational as much as possible. System modifications require serious consideration before incorporation both to minimize down time and to avoid changing the data base which might make data comparisons meaningless. The general rule

in the past has been to keep the system intact during the severe weather season (spring to fall) and make major modifications during the winter. Of course, the activity is very low during the winter which increases the check out difficulty. Therefore, a second system will be assembled which can be used for additional investigation during the season. This system will be built around two RCA 1802 CMOS processors and specifically designed for the weather project.

If this monitoring technique is to be fully evaluated, more stations will be required to provide more complete geographical coverage and provide triangulation information. A second station is under construction in the Kansas City vicinity by Don Witte, a fellow engineer and amateur radio operator. Several storm fronts have been located with data from both stations. At this time, the Kansas City station is not operating continously. The plan is to have a number of stations, either manned or unmanned, with a data link to a central processing station where severe weather conditions could be assessed. This is an ambitious undertaking for the few individuals presently involved, but it may come to pass.

SCIENTIFIC SYSTEMS LABORATORIES, 2031 E Cerritos Suite J, Anaheim, CA 92806, 714-776-5003, has a new modem chip designated the SL1200. It sends and receives fsk at rates up to 1200 baud using tones of 1200 and 2200 Hz. It also sends a 900-Hz tone after the EOT sequence and can send a 2025-Hz signal to deactivate telephone company echo suppressors. The (100) price is reported to be $75.

TECH AID, 7115 Leesburg Pike #327, Falls Church, VA 22043, 703-534-0813 is looking for engineering job applicants. A telephone engineer is needed for a 3-month plus assignment in this area. There is also a permanent position for a digital engineer with A/D and telecommunications experience. Contact Bob Lamm.

FICOMP, INC., 3017 Talking Rock Dr., Fairfax, VA 22031, 703-280-1394, has a new utility package which consists of seven machine-language (.COM) programs for computer systems using the Zilog Z80 CPU and the Digital Research CP/M 2.2 disk operating system. The unit price is$24.95. Contact FICOMP for a brochure.

PASCAL PRIMER is the title of a new book by Mitch Waite and David Fox just announced by Sams Books. The price is $16.95 + $2 for shipping and handling if ordered by mail. If you can't find it in your local computer store, order from Howard W. Sams & Co. Inc., 4300 West 62nd St, PO Box 7092, Indianapolis, IN 46206, 800-428-3696.

A5 MAGAZINE was recently bought by Mike Stone, WBØQCD, effective August 15. Mike is planning to expand its editorial content into modes other than strictly TV. Mike's address is Box H, Lowden, IA 52255.

THE MICROPERIPHERAL CORPORATION, 2643 151st Pl NE, Redmond, WA 98052, 206-881-7544, has announced a new autodial/auto-answer modem for the Atari 400/800 as well as smart terminal programs for the Atari and Radio Shack Modem I.

THE GEORGE WASHINGTON UNIVERSITY, Continuing Engineering Education, Washington, DC 20052, 202-676-6106, 800-424-9773, is running the following short courses of interest to our members who are in the electronics professions: (Washington, DC)

Date	Title
11/02-11/04	Local Area Computer Networks
11/09-11/13	Microcomputer Applications Workshop
11/16-11/20	Communication Satellite Engineering
11/23-11/25	Software Quality Assurance
11/23-11/25	Fundamentals of Data Communications
11/23-11/25	Microcomputers in Control Systems
11/23-11/24	Computer Communications Concepts
11/30-12/04	Workshop in Data Communications for Microcomputers

INTEGRATED COMPUTER SYSTEMS, 3304 Pico Blvd, PO Box 5339, Santa Monica, CA 90405, 800-421-8166, 800-352-8251 (California only), will be holding four-day courses on Computer Network Design & Protocols, as follows:

09/22-09/25	San Diego, CA
09/29-10/02	Washington, DC
10/20-10/23	Boston, MA
12/01-12/04	Washington, DC

Cost of this course is $795.00.

THE DEAF AND THE TTY

Barry Strassler
Executive Director
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Silver Spring, Maryland 20910
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RADIO TTY FOR THE DEAF

I have been getting many inquiries by radio hams on the possibility of the deaf getting involved with RTTY. Being profoundly deaf myself, my family and friends are deaf. My job and that of my wife, an editor, are deaf-related. My only immediate contact with the hearing world is through my hearing 11-year-old daughter and her coterie of neighborhood friends, through my administrative assistant, through job-related contacts with the non-deaf and through both sets of in-laws. With this kind of background, I hope that it is understandable that my response would be guarded.

There are not that many deaf technical enthusiasts dabbling in electronics, computers and RTTY. I have always felt that should a radio networking concept be developed for the deaf, the inside group of homebrew hobbyists will be the first to generate this kind of enthusiasm. The rest of us will be slow to catch on. Perhaps, on a proportionate scale, the level of interest is the same with the deaf as it is with hearing people. Only the sheer numbers dwarf us, but not the proportion.

To start from scratch, obtaining FCC ham operator's license to operate a station alone requires mastering of the Morse code. This has been the major stumbling block. Perhaps if this requirement were waived for the deaf, then an upsurge in interest will occur.

Voice communication is out of the question for obvious reasons. This leaves us with RTTY. If it is true that more hams use voice rather than RTTY, then for practical purposes the communication circles for the deaf are reduced.

Then another important matter is the question of protocols. To learn to use protocols properly requires training. If poorly administered training sessions are given to the deaf, it will leave them frustrated and perhaps turn them off. The same goes for learning to manipulate the various knobs and dials to tune in properly. It is no reflection on the deaf, but training sessions are longer than with hearing ham students. If the patience of the instructors are not taxed, then this would not be a problem.

Understanding the FCC regulations is very important. Ignorance of the rules would be looked upon with disfavor by the FCC. One deaf telephone user unwittingly dialed direct to his European friends on the TDD unaware that this was a violation of FCC regulations. If the deaf are not trained to observe the FCC regulations, then problems are created.

This is not to say that the deaf cannot learn RTTY. They can. But they cannot be expected, just like anyone else, to master a complicated device in a short time and without training and follow-up. We hope that all radio hams interested in working with the deaf will take these factors into consideration.

TDI is very anxious to see what the upcoming October 16 AMNET conference holds in store for them. □

AMRAD

Amateur Radio Research and Development Corporation

Membership Application/Renewal

Mail to: Gerald Adkins, Treasurer
1206 Livingston St N
Arlington, VA 22205

See reverse for overseas mailing rates.

Dues:		Annual	Life
	Regular	$12	$120
	2nd in family	6	60
	Full-time student	3	-

Please make checks payable to AMRAD.

Name_____
Ham Call_____ Home Phone( )_____

Address_____
City,
State_____ ZIP_____

Class License_____ ☐ ARRL Member
Have: ☐ 2-meter FM ☐ RTTY
☐ Computer model_____
Microprocessor type_____

I agree to support the purposes of the Corporation.

*Signature*_____

THE AMATEUR RADIO RESEARCH AND DEVELOPMENT CORPORATION is a technically oriented club of about 400 radio and computer amateurs. It is incorporated in the Commonwealth of Virginia and is recognized by the Internal Revenue Service as a tax-exempt scientific and educational organization.

THE PURPOSES OF THE CLUB are to: develop skills and knowledge in radio and electronic technology; advocate design of experimental equipment and techniques; promote basic and applied research; organize forums and technical symposiums; collect and disseminate technical information; and, provide experimental repeaters.

MEETINGS ARE ON 1st MONDAY of each month at 7:30 p.m. at the Patrick Henry Branch Library, 101 Maple Ave E, Vienna, VA. If the 1st Monday is a holiday, an alternate date will be announced in the *AMRAD Newsletter*. Except for the annual meeting in December, meetings are normally reserved for technical talks - not business.

THE WD4IWG/R REPEATER is an open repeater for data communications (including RTTY), voice and experimental modes. It is located at Tyson's Corner, McLean, VA and has excellent coverage. It features a semi-private autopatch available to licensed members. Frequencies are: 147.81 MHz input, 147.21 MHz output. The head of the technical committee is Jeff Brennan, WB4WLW, 7817 Bristow Dr, Annandale, VA 22003, phone 703-354-8541.

THE AMRAD NEWSLETTER is mailed monthly to all members and to other clubs on an exchange basis. Technical articles, new product announcements, news items, calls for papers and other copy related to amateur radio and computing are welcome. Honorariums at a rate of $10 per printed page ($20 maximum per author per issue) are paid for original material accepted. Classified ads are free to members. Commercial ad inquiries are invited. The editor reserves the right to reject or edit any portions of the copy. Items should be mailed by the 8th of the preceeding month to Paul L. Rinaldo, W4RI, Editor, 1524 Springvale Ave, McLean, VA 22101; phone 703-356-8918. Full permission for reprinting or quoting items appearing in the *AMRAD Newsletter* is granted provided that credit is given. Mailing is by 3rd Class bulk mail to U.S. addresses and 1st Class to Canada and Mexico. Overseas readers add 96¢ for surface or $7.80 for air mail to annual dues.

THE AMRAD MESSAGE SYSTEM is an S-100 Computerized Bulletin Board System on 703-734-1387, system operator Terry Fox, WB4JFI. Terry's home phone number is 703-356-8334. The system accepts 110, 300, 450 and 600 baud ASCII callers using Bell 103-compatible modems.

THE HANDICAPPED EDUCATION EXCHANGE (HEX) is operated by AMRAD for those involved in education and communications for the handicapped. It accepts both 110/300-baud ASCII and deaf TTY callers. on 301-593-7033. The sysop Dick Barth, W3HWN's home phone is 301-681-7372.

AMRAD OFFICERS for 1981 are:

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THE AMRAD LIBRARY is operated by Tedd Riggs, KC4YN, 8402 Berea Ct, Vienna, VA 22180, phone 703-573-5067. Donations of technical books, magazines, manuals and catalogs are tax-deductible.

AMRAD IS AFFILIATED with the American Radio Relay League (ARRL), the Foundation for Amateur Radio, the Northern Virginia Radio Council (NOVARC) and The Mid Atlantic Repeater Council (T-MARC).

SPECIAL INTEREST GROUPS are formed from time to time. Currently we have SIG's on Deaf Communications and Spread Spectrum Communications. If you are interested in joining or forming a SIG, please contact Bill Pala, WB4NFB, 5829 Parakeet Dr, Burke, VA 22015; phone 703-323-8345.

TRAINING CLASSES are run as needed. Please discuss your training requirements with any Director.

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